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Morris Arboretum Bulletin

FEBRUARY, 1956

VOL. 7 NUMBER 1

Flowers of Evodia Daniellii

Published by
The ASSOCIATES of
THE MORRIS ARBORETUM

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The Morris Arboretum Bulletin is published quarterly at Philadelphia Pa., by the Associates of the Morris Arboretum, Chestnut Hill, Philadelphia 18. Subscription, $1.00 for four issues. Single copies, 30 cents. Free to Associates.

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ARBORETUM ACTIVITIES

PAVING OF ROADWAYS

During the early winter approximately 1,000 feet of service roads in the Arboretum were hard-surfaced. Two sections were done at this time: one running from the Gate House on Hillcrest Avenue to the stream near the log cabin, the other extending from the corner of Hillcrest and Germantown Avenues down along the west side of the Arboretum to the lilac planting. Both of these sections were subject to bad washouts at times of heavy rain and the new hard surfaces will result in a great saving of time and labor formerly required to repair the roadbeds following severe storms. They will also make it appreciably easier to walk along these roads which were formerly surfaced only with loose stones and gravel.

NEW WOODS TRAILS

One of the most attractive sections of the Arboretum, the wooded slope along the Wissahickon, has been largely inaccessible because of the dense growth of underbrush and the steepness of the grade. This winter a series of trails has been laid out, graded and in places protected by logs. It is now possible for visitors to walk along the creek and to wander up and down the slope, enjoying the beauty of the only naturally wooded area within the Arboretum.

(Continued on page 15)

A Horticultural and Botanical History of Ginkgo

HUI-LIN LI

INTRODUCTION

No plant more than Ginkgo has a stronger claim to be called a "living fossil," a term used by Darwin to designate survivals of the past. This very same tree was thriving a hundred and a quarter million years ago when Dinosaurs were still roaming the earth, and the genus has remained from that time until now almost unchanged. Its ancestry traces back for another hundred million years to the later part of the Permian period in late Paleozoic. These ancestral and related plants were most abundant during the Upper Triassic and the Rhaetic-Jurassic ages in the early Mesozoic. Thus the sole living member of a once great and dominant race of the vegetation of the world, the Ginkgo is, among all the tens of thousands of plant species existing today, a most precious and tenuous link between the present and the remote past.

From its last natural refuge in the mountains of eastern China, Ginkgo has now spread through cultivation to many parts of the world. With the aid of man, it now reinhabits grounds lost to nature during the last million years. It thrives even in a modern urban environment which many other trees cannot tolerate. It defies the scourge of all pests. A tree that survives the vicissitudes of a hundred million years must have come from a most tenacious stock and have been specially selected by mother nature out of thousands of similar and dissimilar plants of the same age.

Ginkgo, with its spreading rigidly ramified branches and curiously shaped leaves, is a tree of great distinction and dignity in appearance. Human history appears insignificant when compared with the genealogy of this tree which now stands in the gardens and along city streets created by man who appeared millions of years later. As an eminent paleobotanist, the late Sir Albert Seward (1938), in discussing its geological history, remarks: "It appeals to the historic soul: we see it as an emblem of changelessness, a heritage from worlds too remote for our human intelligence to grasp, a tree which has in its keeping the secrets of the immeasureable past."

Ginkgo survives as a living plant in China only. Although there is a great mass of writings on this tree in the western languages, it does not seem that the history of its origin and cultivation in the Orient has ever been properly investigated. There are the often repeated but somewhat misinformed statements that Ginkgo has been in cultivation in China since very ancient times, that its origin is entirely unknown, and that it is preserved in cultivation only by Buddhist monks on monastery grounds.

This paper reviews briefly the horticultural and botanical history of the plant, its historical and geographical origins, early cultivation in China, subsequent introduction into Japan and the western world, botanical investigations made on the plant, and problems pertaining to its scientific name.

ORIGIN IN CHINA

Ginkgo is unknown to the ancient Chinese; its records in the literature cannot be traced definitely beyond one thousand years. The earliest Chinese civilization prospered along the Yellow River valley in northern China. Many plants have been domesticated there since time immemorial; these as well as numerous wild plants are recorded in the earliest classics and other writings of three thousand years or more ago. Among the earliest domesticated trees are the Peach and Apricot; the wild ancestors of the former have long since disappeared. Numerous other trees like Pines, Arborvitae, Juniper, Jujube, etc. are mentioned in this ancient literature, trees that are still native to northern China. But Ginkgo is conspicuously absent, attesting to the fact that it was not a native tree of that region in ancient times, although at present it occasionally occurs there as a cultivated species.

Before the Sung dynasty, in the late 10th century, Ginkgo was almost unknown in northern China. It first appeared in literature in the early Sung in the 11th century as a plant native to eastern China, south of theYangtze River. During the Sung dynasty, the Yangtze River valley became more and more developed and more closely integrated with the north. Because of pressure exerted by the invading Chin Tartars from the north, there was a gradual southern movement of culture and population. This movement was particularly intensified around 1127 A. D., when the capital was moved from Kaifeng in northern central China to Nanking and finally to Hangchow in eastern China south of the Yangtze River. Before this, the period is known as the Northern Sung (960-1127 A. D.) and from then on until the end of the dynasty, when the Mongols conquered the whole of China and established the Yuan dynasty, as the Southern Sung (1128-1279 A.D.).

Earliest Records

In the 11th century, Ginkgo, when it first appeared in the literature, was known as a plant of the region south of the Yangtze River in eastern China. At Kaifeng, the capital, it was considered as a rare and precious "fruit." It was sent as tribute yearly from its native region to the capital to be presented to the Emperor. Subsequently a few trees were planted in the capital and this is the first recorded instance of cultivation outside of its natural range. Gradually it became more commonly grown and its cultivation also spread to other regions.

Previous to the Sung dynasty literature, there are only a few alleged but unproven references to Ginkgo. In a poetical essay, entitled Wu Tu Fu, on the capital of the Wu Kingdom, by Tso Ssu of the Tsin dynasty (265-420 A. D.), there is mention of a fruit called P'ing Chung Kuo. The Wu Kingdom is modern Kiangsu and Anhwei provinces, the native haunt of Ginkgo. A later commentator noted that the fruit is of a silvery color. For this reason, herbalists and botanists of subsequent ages such as Li Shih-chen in 1596, and Wu Chi-chun in 1848, suggest that this might be referrable to Ginkgo but none of these authors claims it as provable.

Ginkgo is also mentioned in a work called Chung Shu Shu, Book on the Culture of Trees, a small volume on agriculture attributed to the famous gardner Kuo To Tu or Kuo the Hunchback of the 8th century. However, this is actually a work of much later origin, probably of the Yuan dynasty around the 14th century. That Ginkgo is mentioned in this work as Yin Hsing, Silver Apricot, a name apparently not in use earlier than the late 11th century, indicates its much later origin.

In another instance Ginkgo is possibly meant in a story attributed to a T'ang poet in a Sung note book. Thus Ginkgo might have been known to the northern Chinese before the Sung dynasty, but it was apparently a very rare plant not then in cultivation.

Cultivation in Sung

There are many definite records about this plant in the Sung literature. It was, as mentioned before, first sent as tribute from its native place, mentioned specifically as Suancheng of the Ningkuo District in what is now the southern part of Anhwei province, south of Wuhu, a port along the Yangtze River. In a Sung notebook entitled Shi Hua Chung Kuei, it is said that "In the Capital (Kaifeng), there was originally no Ya Chio (Ginkgo). Since Prince Li Wen-ho came from the south and transplanted it to his residence, it becomes famous. From then it gradually propagates and multiplies, and fruits from the south are no longer considered precious." Prince Li lived in the first half of the 11th century.

In another Sung work entitled Chun Chu Chi Wen, it mentions that "During the reign Yuan Feng (1078-1084) there was a fruit in the capital called Ya Chio Tzu (Ginkgo). There were four big trees producing several bushels of fruits each year."

The name Ya Chio, meaning Duck's Foot, refers to the shape of the leaves. This is evidently the earliest name of the plant, and possibly the name first known in its place of origin. After the nut became known in the capital Kaifeng, another name, Yin Hsing or Silver Apricot, referring to the "fruit" was adopted, and the two names were often used concurrently.

Ginkgo in Sung Poetry and Paintings

The Sung dynasty is a period of great artistic and literary activity. During this period, Ginkgo was not only first introduced into cultivation, but it also began to appear in poetry and in paintings. It was eulogized by many famous poets, who mostly praised its "fruits" and sometimes also its leaves. Undoubtedly the praise of this rare "fruit" by the many renowned poets brought fame to this plant in northern China.

Among the verses we may mention especially the ones by the famous poets Ou-yang Hsiu and Mei Yao-ch'en because of their historic interest. Ou-yang (1007-1072 A. D.), a famed historian, essayist and poet, was a native of Kiangsi Province. Mei (1002-1060), also a famous poet, was a native of southern Anhwei Province. Both then held official positions in the capital Kaifeng.

Their exchange of poems began when Ou-yang presented Mei with some Ginkgo nuts from the trees of Prince Li mentioned above. This nut, then rare and considered precious in the capital, was familiar to Mei as it was produced in Mei's home region. In expressing his gratitude to Ou-yang he wrote a verse which says that Ya Chio (Duck's Foot) was unfamiliar to the northerners just like walnut to the southerners, and that it was so named because of its leaves. It was produced in Mei's native region, Suancheng. He was thus happy to find it planted in the capital as a rare and precious "fruit" and was sentimental in receiving this as a present since it was originated from his home area.

Ou-Yang was a great historian, and on this occasion he took the opportunity in answering Mei with a poem in which he wished to leave some useful information for posterity. The contents of the verse can be translated simply as thus:

"Ya Chio (Duck's Foot) grows in Kiangnan, with a name which is not appropriate. At first it came in silk bags as a tribute, and as Yin Hsing (Silver Apricot) it became cherished in the middle provinces. The curiosity and effort of the noble Prince [Li] brought roots from afar to bear fruit in the capital. When the trees first fruited they bore only three or four nuts. These were presented to the throne in a golden bowl. The nobility and high ministry did not recognize them and the Emperor bestowed a hundred ounces of gold.

Now, after a few years the trees bear more fruits. The friendly owner presents me with these nuts like giving me pearls. In the past Chang Chien (2nd century B. C.) introduced Grape and Pomegranate [from Central Asia]. We can imagine that when these first came, they must be similarly highly valued as these nuts. But now these plants are common all over China, growing along fences and walls. The very things are still the same, but human nature changes in time. Someone should record the beginning so that future generations can know its origin. This is thus not only continuing your verse, but also contributing to history."

Subsequently they further exchanged poems when Mei returned to his home town and sent the nuts to Ou-yang. In these poems Ou-yang mentioned that Mei's nuts were collected from the forests in the wild and both poets now used the name Yin Hsing or Silver Apricot but not Ya Chio or Duck's Foot.

Ginkgo was the subject of many verses by other poets during the Sung dynasty. It also became a frequent subject for painting. In the Hsuan Ho Hua P'u, Catalogue of Paintings of the Imperial Collection of the reign of Emperor Huei Tsung (reign 1101-1125) there are listed several paintings of this plant. One of them entitled "A picture of Yin Hsing (Silver Apricot) and the bird Pei Tou Wen," was by an artist Yo Shih-hsuan, an official of the reign of Emperor Shen Tsung (1067-1084). Another entry lists two paintings of "A study of Ya Chio (Duck's Foot)" by Prince Tuan Hsien Wang, 4th son of the Emperor Yin Tsung (reign 1063-1066) and brother of Emperor Shen Tsung.

It is interesting to note that the earlier interest in the plant is because of the edible nut and the ornamental features of the plant. The "fruit," of course, is not a true fruit, but a drupe-like seed. It is yellowish when mature, of the size and appearance of a small apricot but has a silvery bloom on the outside, hence the literary name Yin Hsing or Silver Apricot. The inside kernel is edible. This nut is frequently compared with the walnut by Sung poets, a popular nut fruit of the north.

Ginkgo in Later Dynasties

There are many herbals and materia medicas in the T'ang and Sung dynasties, but none of them mentions Ginkgo. Ginkgo first appeared in the herbals of the Yuan dynasty (1280-1368), in Shih Wu Pen Ts'ao, or Edible Herbal by Li Tung-wan, and Jih Jung Pen Ts'ao or Herbal for Daily Usage by Wu Jui. In Wu's book it is noted that the nuts, if eaten in excess, especially by children, may be slightly poisonous.

Besides the names mentioned, in the Yuan dynasty there were other names in common usage, such as Pei Kuo (White Fruit), Pei Yen (White Eye), Ling Yen (Spirited Eye), Jen Hsing (Nut Apricot), etc. Among these, Pei Kuo or White Fruit is still the most widely used colloquial name throughout the country in modern times, while Yin Hsing or Silver Apricot remains as the common literary name.

Another common name that appeared in later times is Kung Sun Shu or Grandfather-Grandson tree. This attests to the fact that only old trees bear fruit and therefore a tree planted by a man will be useful to his grandson.

The Ginkgo is a dioecious tree, that is, the male and female flowers are borne on separate individuals and hence only the female tree bears fruits. This phenomenon was considered mysterious by the earlier observers. They early noted, however, that there are male and female trees and the two should be planted nearby to insure fruiting, but they also entertained the strange idea that female trees if planted alone by the side of water can also bear fruit.

After the Sung and Yuan dynasties, Ginkgo seems to be widely cultivated all over the country. The Sung and Yuan authors do not mention specifically that the tree occurred only in cultivation including its native habitat, nor is there any association of this tree with religious institutions. The writings of these authors seem to imply that the tree as occurring in southern Anhwei was indigenous. And it has always been the custom of the Buddhist as well as the Taoist priests to preserve portions of the natural forests around their temples, thus preserving many indigenous species which otherwise would have perished in agricultural areas. Thus, venerable specimens are often found on temple grounds, but they occur in many other places as well. Very old trees, Ginkgos as well as many other kinds, are often revered and preserved because of geomantic beliefs and they are sometimes, especially in the remote interior, decorated with incense stands or wayside shrines. It is a kind of primitive nature worship, and the tree is honored because of its age and not its kind. Contrary to the much perpetuated belief, emphatically stated especially by Wilson (1920) and frequently copied by other horticultural writers, the Ginkgo has no association with Buddhism. The cultivation of the Ginkgo tree has no religious origin or significance and its preservation is not attributable to planting by Buddhist or Taoist priests.

Ginkgo is described in detail in the great herbal Pen Ts'ao Kang Mu of 1596 by Li Shih-chen and also in the great botanical work Chih Wu Ming Shih Tu Kao of 1848 by Wu Chi-chun, where a good figure of the foliage and fruit is found.

Li repeatedly says that the Ginkgo originates from Kiangnan, a province of the Ming dynasty embracing the modern provinces Kiangsu and Anhwei. On the name of the plant he says that it was originally called Ya Chio (Duck's Foot) because of the shape of the leaves and that when it was first sent as tribute in the early Sung to the throne, the name was then changed into Yin Hsing

or Silver Apricot because of the whitish "fruit." His description of the plant which was detailed and quite accurate reads:

"Yin Hsing (Silver Apricot) grows in Kiangnan, especially around Suancheng. The tree is twenty to thirty feet high with thin and straight-veined leaves like the web of a duck. The leaf has a notch at top and is green above and palish beneath. The flowers are borne in clusters in the second month and are rarely seen by people. A single branch often bears tens or hundreds of seeds resembling the seeds of Lien (Melia). The seeds become ripe after frost, and the flesh is removed for the nut inside. The nut is pointed at both ends. Those with three ridges are male and two female. The kernel is green when young and later becoming yellow. Male and female trees should be planted nearby to insure fruiting, or the female trees can be planted along water. Another method to insure fruiting is to graft a male branch onto the trunk of a female. . . . . ."

The statement that the number of ridges on the nut can be used to distinguish sexes appears in several other and earlier works. Nuts with three ridges are rare. It seems that there is hardly any truth in this observation.

Ginkgo is now a widely grown ornamental and nut tree in most parts of China. Occasionally it is made into a dwarf tree for pot culture. The kernel is eaten roasted, or sometimes cooked with fowl or meat. There are also certain medicinal effects attributed to the kernel.

Introduction Into Japan

Ginkgo was introduced from China into Japan at a fairly early date perhaps in the Sung dynasty when the tree first became known in northern China. In Japan there are specimens alleged to be nearly a thousand years old. The tree is known there as Icho and the fruit Ginnan, the former the corruption of the Sung Chinese name Ya Chio (Duck's Foot) and the latter the Chinese Yin Hsing (Silver Apricot). (Koidzumi 1936, Makino 1951).

The exact date of introduction from China to Japan is unknown. Wilson's statement (Wilson 1920) that "the tree reached Japan with Buddhism in the 6th century of the Christian era" is entirely unfounded, as Ginkgo was at that time not even yet known in China. And, as stated elsewhere, the tree has no association with Buddhism whatsoever except incidental planting on temple grounds. It seems to have been carried from southern Kiangsu and Anhwei, the original habitat of the tree, directly to Japan. The Japanese pronunciation of the names of the trees is closer to the Wu dialect of southern Kiangsu than to the northern Mandarian.

Moreover, there is known in Japan a legend about growing a Ginkgo tree from cutting in southern Kiangsu in China. According to the Gazette of Kunshan, a district in southern Kiangsu in China, this is the story of a Ginkgo tree in the Sung dynasty. It is said that when Emperor Kao Tsung moved from Kaifeng in the north to Nanking and Hangchow in the south in 1127, the imperial calvacade crossed the Yangtze River into southern Kiangsu. Coming to a town called Chen I near the city Kunshan between Soochow and Shanghai, an official named Kung I, a native of the northern capital Kaifeng, picked a branch of Ginkgo, sticking it into the ground and prayed that if the branch lived, he would settle there. The branch later developed into a huge tree and in later years the trunk became gnarled and twisted and adorned with many hanging "nipples" as in other venerable trees of this same kind.

In both China and Japan, there are now many specimens of immense size. On very old trees there often develop peculiar burs which are called nipples, "chi-chi" in Japanese. These are due to abnormal development of dormant or adventitious buds. If these hanging burs reach the ground, they take root and bear leaves. (Fujii 1895). Henry (Elwes & Henry 1906) gives a picture of such an old tree in western China which is reproduced here. (Fig. 1).

Fig. 1. A Ginkgo tree in western China. (From Elwes & Henry, Trees of Great Britain and Ireland, 1906)

Introduction Into the West

Ginkgo was first made known to the western world by Kaempfer, a surgeon in the employ of the Dutch East India Company, who first observed it in Japan in 1690 and published in 1712 a description with a figure of the foliage and fruit (Kaempfer 1712). The tree was first introduced into the Botanic Garden at Utrecht. Jacquin brought it into the Botanic Garden at Vienna sometime after 1768. It was introduced into England about 1754. (Henry 1906).

Most of the earlier trees raised in Europe appear to have been males. The first recorded female tree was one found by DeCandolle near Geneva in 1814. Scions from that tree were grafted upon a male tree in the Botanic Garden at Montpellier, where the first perfect seed is reputed to have been produced.

Ginkgo was first introduced into America in Philadelphia. As far as authentic records go the oldest tree in this country is the one in Woodlands Cemetery, in West Philadelphia, which was introduced by William Hamilton from England in 1784. This is a magnificent specimen of a male tree. Harshberger (Wilson 1920) is of the opinion that the Ginkgo tree in the old Bartram Garden in West Philadelphia is the oldest and the first planted in America because the garden is older than that founded by Hamilton and the tree is larger. Elsewhere in Philadelphia, there are other large specimens scattered over the area. An old tree in Germantown, a male one, has a female branch grafted onto it, leading many to believe that Ginkgo is monoecious. In the Morris Arboretum, the largest tree is a female one, which was planted over seventy years ago, now measuring 7½ feet in girth. This tree has fruited for a number of years and now bears a heavy crop of seeds every season.

The Ginkgo is now probably the most esteemed street tree in this country, especially valued because of its upright habit and freedom from insect pests. It is considerably planted in Philadelphia, Washington, D. C., New York, and many other large cities, especially in the east. It is ironical that the oldest living species of trees is better suited to the most modern man-made habitat than almost any other tree.

Botanical Investigations

The name Ginkgo was given by Kaempfer. Kaempfer's designation was adopted by Linnaeus, who in 1771, described the plant as *Ginkgo biloba*. In 1797, the English botantist J. E. Smith (1797) considered the name "uncouth and barbarous" and renamed it *Salisburia adiantifolia*. However, the latter name has no nomenclatural standing as personal preference is not a valid reason to reject an older legitimate name.

When Ginkgo was first known to science, it was regarded as one of the conifers and generally included in the Taxaceae. In 1895, the Japanese botanist Hirase (1895-1898) made the startling discovery that the ovules are fertilized by motile sperm-cells conveyed to them by pollen tubes. This differs radically from all other conifers, taxads, and flowering plants which have non-motile male nuclei. Motile sperm-cells are found only in the lower plants and in the Ferns and Cycads. This discovery established definitely the unique isolated nature of Ginkgo which was raised into ordinal rank by Engler.

Hirase's find is often claimed as one of the great discoveries in botany in the 19th century. His discovery, followed by further investigation by other botanists, stimulated many detailed studies on the various interesting features of this most unusual plant.

The Ginkgo is a deciduous tree. The branches are beset with short spur-like shoots which bear clusters of fan-shaped leaves and flowers. The venation in the leaf is open and dichotomous. The male and female flowers are produced on different trees. The male flowers appear in pendulous catkins of numerous loosely arranged stamens. The female flowers arise usually in pairs, each a long stalk with 2 naked ovules. The seed is drupe-like with a fleshy outer covering enclosing a woody shell with a kernel. (Fig. 2).

All these structures and many other interesting details have been intensively studied by many botanists especially the unusual process of fertilization noted above and the nature of the ovule. The ovule bears a collar-like rim at the base, a structure that has given rise to much discussion. (Fujii 1896, Shaw 1908). The development of the seed is also very unusual, as the ovule drops before fertilization and the embryo is formed later in the detached ovule as it lies on the ground during the winter. (Eames 1955). The equally remarkable development of the embryo was first described by Strasburger (1872). The botanical aspects of *Ginkgo biloba* have been monographed by Seward and Gowan (1900) and Sprecher (1907).

The female tree, because of the disagreeable odor of the fleshy covering of the fallen seeds, is less desirable than the male tree in cultivation, especially as street trees. It is claimed that there are some differences in the growth habit of the two sexes, the male trees being more pyramidal and the female more spreading, and that the male trees tend to loose their leaves earlier in the autumn. These characters, however, do not appear to be constant enough to be relied upon. As it takes many years for the trees to flower, it will be highly desirable to devise some way of telling the sexes in young trees. Recent studies have

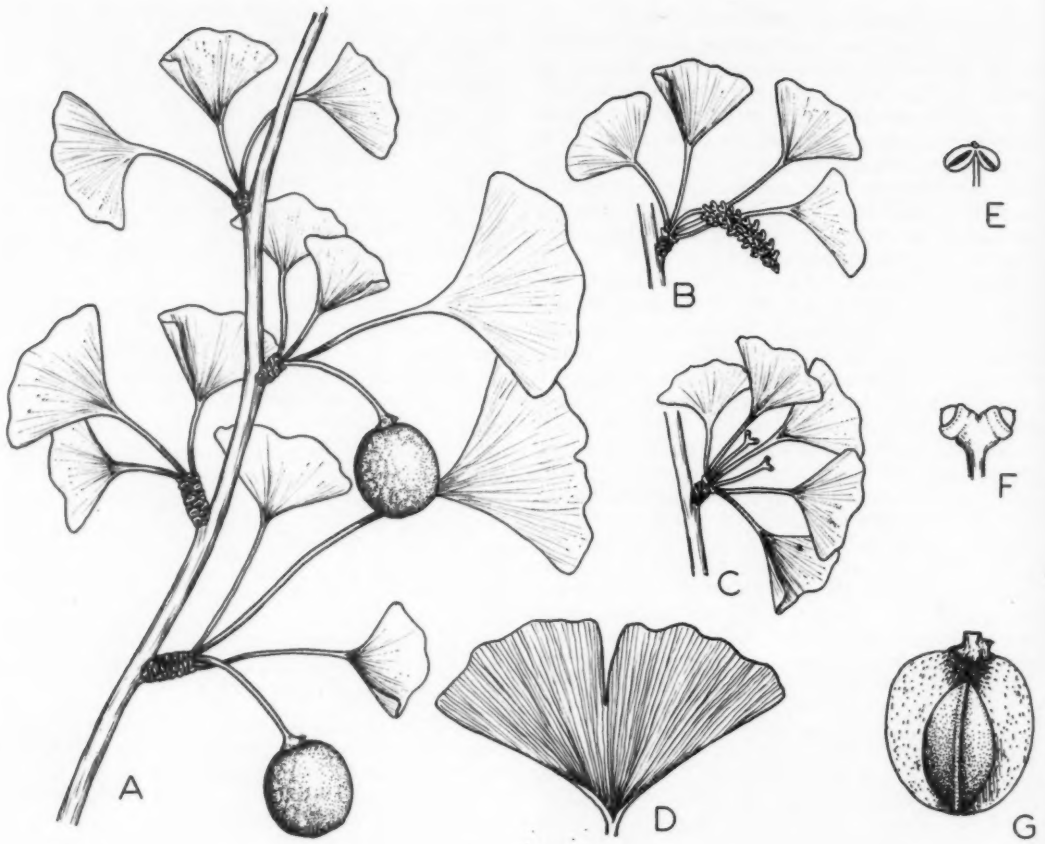

Fig. 2. *Ginkgo biloba.* A. A fruiting branch, X ½. B. Branch with male catkin, X ½. C. Branch with female flowers, X ½. D. A leaf showing venation, X 1. E. A stamen, X 4. F. A female flower, X 2. G. Section of seed showing nut, X 1.

shown that there is some difference between the chromosome apparatus of the male and female trees. If a simple technique can be devised to study this chromosome phenomenon, it will be of great help in eliminating young female trees in horticultural plantings.

The study of the only living survival of a very ancient and once dominant group of plants aids greatly our understanding of the past history of vegetation on the earth. Without this living material many paleobotanical problems will remain unelucidated. The fossil history of Ginkgo and its relatives, outside the scope of this review, is a subject much discussed in paleobotanical works. For a detailed and authoritative treatment, the work of Seward (1919) may be consulted.

Geographical Origin

Since the middle of the last century when China was open to the exploration of the botanical collectors, most of these explorers were anxious to discover the native haunts of this famous plant, but though there were claims of finding this tree in the wild state, none seems to have received any recognition.

Among the earlier and also the widest claims was the one made by the noted traveller Mrs. Bishop toward the end of the last century. In various publications, as quoted by Masters (1902), by Henry (1906), referring to a letter of hers to the *Standard,* Aug. 17, 1899, and by Seward (1911), referring to her book *Untrodden Paths in Japan,* she reported that she had observed it grow-

ing wild in Japan in the great forests in the northern island Yezo, and also in the country at the sources of the Great Gold and Min Rivers in western China. Her claim, however, was seriously questioned by Henry, Seward and other authors. Wilson (Rehder & Wilson 1913, Wilson 1916) is of the opinion that the tree in the forests of Japan and western China that Mrs. Bishop took for the Ginkgo was Cercidiphyllum. Wilson states that he had never met with a spontaneous specimen and in his opinion the tree no longer exists in the wild state.

All botanists and foresters of Japan deny that Ginkgo is indigenous in any part of Japan, but was definitely introduced from China. Plant explorers sometimes observed the plant in parts of China in natural woods but these were often passed as escapes from cultivation or only in a semi-wild state. Often to deny the assertion that it still occurs wild in China, the statement to that effect made by Wilson, because of his extensive experience in China, is usually quoted.

However, Wilson's exploration in China, though extensive, covers only a small part of the country. He collected especially in the Lushan area in northern Kiangsi in eastern China and more widely in western China in western Hupeh and Szechuan. As most of the curious conifers in China and Japan, which are many, have a very limited range of distribution, it is unsafe to make a categorical statement about their range and occurrence. For instance, the recently discovered and much discussed Metasequoia occurs in a small area in western China within the region extensively searched by Wilson on his many trips but was only narrowly missed by his itinerary.

Henry pointedly notes in 1906 (Elwes & Henry 1906) that "Its native habitat has yet to be discovered; and I would suggest the provinces of Hunan, Chekiang, and Anhwei in China as likely to contain it in their as yet unexplored mountain forests." None of the many modern plant explorers working in China during the last hundred years was familiar with the historical records of Ginkgo to guide them in their explorations, and Henry's statement, attesting to his wide knowledge of the Chinese flora and his sagacious observations, is closest to the truth. As noted above, early Chinese records clearly indicate that southern Anhwei, especially the region of Ningkuo and Suancheng, is the area where Ginkgo originates. Both are now names of cities, but formerly Ningkuo was also the name of a larger district with modern Suancheng as its leading city. And in modern plant exploration, the most reliable reports of Ginkgo as a wild plant also came from this area, the mountain region along the border of Anhwei and Chekiang.

Frank Meyer, botanical explorer for the United State Department of Agriculture reports[1] that "the Ginkgo grows spontaneously near Changhua Hsien, about 70 miles west of Hangchou in the Chekiang province, China." There "the trees are so common that they are cut for firewood." Wilston (1916) says that "it is, however, by no means certain that this is the original home of the Ginkgo as these trees may all have descended from a planted tree." But he says further than "Meyer's discovery, however, is interesting, for there is no other evidence of the Ginkgo growing spontaneously or that it is cut for any purpose."

The area visited by Meyer lies in the western part of the Tien Mu Shan Range, along the northwestern border of Chekiang and southeastern Anhwei. It is in immediate continuation with the Ningkuo and Suancheng area where early Chinese records place the original home of Ginkgo. The highest mountain of this range reaches 5,075 feet.

Wilson's assertion that these ten square miles of Ginkgos may have all descended from a planted tree seems to be highly improbable. Moreover, this area was visited subsequently by other Chinese botanists, and they also noted the same extensive occurrence of the Ginkgo tree in a spontaneous state. In the twenties and thirties, Ginkgo was observed and collected in that area repeatedly by Cheng, Tsoong, and others (Cheng & Chien 1933), and Cheng notes especially that "This tree is very common in Tienmu-shan, growing in association with coniferous and broad-leaved trees. It seems to grow spontaneously in that region."

In this area and the surrounding regions, the Ginkgo also commonly occurs as a cultivated tree, more frequently so than in other parts of China. This is borne out by my own observations as I lived in southern Kiangsu for many years and also travelled extensively in northern Chekiang and southern Anhwei although not in the Tien Mu Shan area. As early as a hundred years ago, Fortune (1847, 1857) observed enormous specimens near Huchow and Ningpo in northern Chekiang and also in southern Kiangsu. In the nearby Chuki District, Tseng (1935) records a number of varieties of Ginkgo trees cultivated for their nuts.

Southeastern China, especially southern Anhwei and Chekiang, is the home of many rare plants. Among the conifers and taxads, this is the native haunt of the monotypic endemic Pseudolarix and Nothotaxus, and also *Torreya grandis, Carya cathayensis* and other rare species. It is the refuge of many relict plants. The case of the Ginkgo is very similar to *Torreya grandis* and *Carya cathayensis,* which occur also in this area both in wild and cultivated conditions, for their

[1] The quotations are from Wilson (1916), who does not cite the source. I have not been able to trace these to any of Meyer's publications.

edible nuts. Undoubtedly the last refuge of Ginkgo lies also in this area, a fact not only sustained by historic records but also corroborated by the observations of modern botanical explorers. (Figs. 3, 4).

Ginkgo is sometimes also observed in a supposedly wild or semi-wild state in other parts of China, especially in the mountains of the southwest, in Kweichow, Szechuan, etc. It may be that the natural range of Ginkgo is fairly wide and scattered, but undoubtedly the area in southern Anhwei and northern Chekiang in eastern China is the center of origin of all the cultivated trees, both in China and Japan as well as in other parts of the world.

The Name Ginkgo

In recent times there have been considerable discussion and dispute on the name Ginkgo. Moule (1937, 1944), Thommen (1949) and others believe that as it is apparently intended by Kaempfer to give a romanized version for the Chinese ideographs Yin Hsing, it should be more correctly transliterated into the Japanese "Ginkyo." Some botanists, such as Pulle (1948) and Widder (1948), in following this view, consider Ginkgo as an "unintentional orthographic error" and replace it with Ginkyo. On the other hand Henry (Elwes & Henry 1906) and Barclay (1944) suggest that the name might be a transliteration of the Chinese ideographs Yin Kuo meaning Silver Fruit.

The prevalent Japanese name of the tree is Icho and the nut Ginnan. Moule, who examined Kaempfer's essential manuscripts in the British Museum

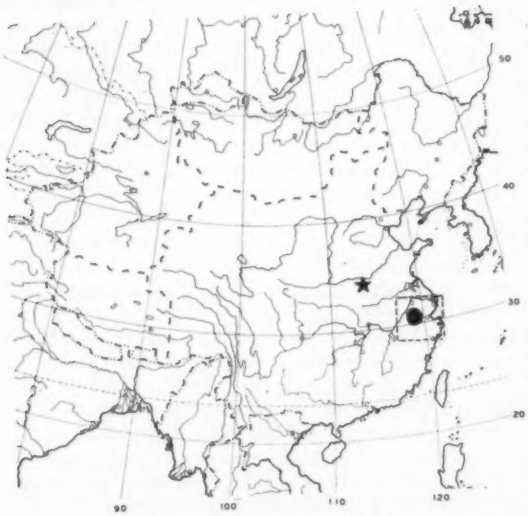

Fig 3. Map of China. Black dot = original habitat of Ginkgo; star = city of Kaifeng; dotted square = area covered by Fig. 4.

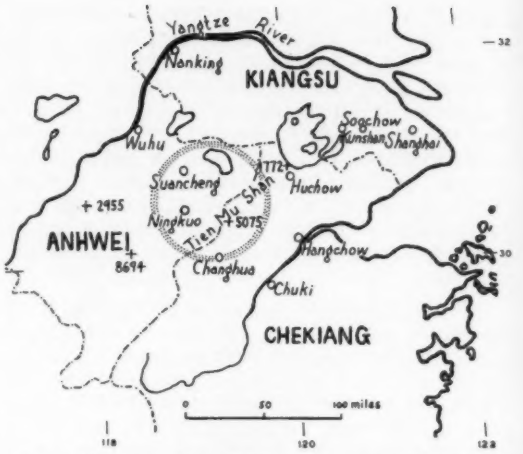

Fig. 4. Map of eastern China. Circle = approximate area of the original habitat of Ginkgo; elevations in feet

and found nothing like the word Ginkgo in these, is of the opinion that "according to Kaempfer himself, to the books, and to modern evidence, the name of the tree is icho and of the fruit ginnan; while the scarely known form ginkgo (ginkyo) seems to have got into *Am. Exot.*, and thence into scientific botany, by some slip or misprint which has not been explained."

The case, it seems to me, can be readily settled by a study of Kaempfer's original text, which some authors, such as Henry and Barclay, apparently failed to consult. Their suggestion that the original ideographs concerned being Yin Kuo (Silver Fruit) is untenable as Kaempfer clearly indicates his Ginkgo being a transliteration of Yin Hsing (Silver Apricot). Moreover, the name Yin Kuo does not exist either in the literature or as a colloquial name in China and Japan. It is not found in the twenty-five such names for the tree and nut as given by Moule (1937).

The name Ginkgo appears in the 5th and last fascicles of Kaempfer's work, published twenty years after he left Japan. This fascicle lists and describes the economic plants of Japan. He gives for most of the plants first their names in Chinese ideographs which, as he clearly states in the preface, are the literary names. These Chinese ideographs as pronounced in Japan are romanized and these are followed by romanized Japanese colloquial names. In a few cases the literary names are the same as colloquial names and these are indicated as such.

Thus in the case of Ginkgo, the Chinese ideographs Yin Hsing are given at the beginning of the item (p. 811) and again on the plate (p. 813). Ginkgo is not "the scarcely known form" of Moule, but the literary name as occurring in Japanese lit-

erature at the time and especially in all herbals then in use, which were either translations from the Chinese or Japanese works with plant names of Chinese origins.

Now that the derivation of the name Ginkgo was clarified there remained the problem of the form of transliteration. The first line of the item in Kaempfer reads thus: "Ginkgo, vel Gin an, vulgò Itsjò. Arbor nucifera folio Adiantino." This clearly shows that Kaempfer considers that there are two ways of pronouncing the same ideographs, either as Ginkgo or Ginan. It is also to be noted that in the description following he says that the fruit is called Ginnan. The above quoted line of Kaempfer including the Chinese ideographs is cited in Endlicher's Synopsis Coniferum (1847) in the synonymy of *Salisburia adiantifolia* Smith.[2]

As is well known the same Chinese ideographs may have several different pronunciations in Japanese, varying from Japanese sounds to several types of Chinese sounds borrowed from China at different ages and from different geographical areas. Kaempfer indicates two different ways of pronouncing Ginkgo. In the Japanese herbal Honzo Zufu of 1828 the name Ginkgo is also given in two sounds, with the note that Ginnan is a Chinese pronunciation of later origin. Koidzumi (1936) and Makino (1951) quote other Japanese authors that Icho is the Chinese pronunciation of Ya Chio in the Sung dynasty, and the former says also that Ginnan is a Chinese pronunciation of later times. I believe both these pronunciations Icho and Ginnan came to Japan from southern Kiangsu in China, near the region where the tree originated. In the modern Wu dialect of the area, Ya Chio is pronounced Ai Cho and Yin Hsing as Nin An, both closer to the Japanese names than to the Mandarian or northern Chinese.

The most disputed fact is the seemingly quaint spelling "Ginkgo" of Kaempfer. Moule (1944) quotes Arthur Waley that "Ginkgo is a distortion of Ginkyo, which is the logical and regular reading of the Chinese name (Yin Hsing), but has no existence in the real language," adding the remark that this "is the true account of the word."

These authors, however, are considering the modern pronunciation and romanization of the word while Kaempfer was writing about his observations made over 250 years ago. The pronunciation of these words at that time might be slightly different. Fortune (1863), for instance, observing this plant in Japan about a hundred years ago, says that the nut is called Ging Ko in Japanese shops.

In the work of Kaempfer, the individual Chinese character Hsing is romanized elsewhere as Kjoo or Koo. In the preface he says that some of the sounds, like k and g, especially in composite names, are not readily distinguished and he gives such examples as *K*oquan or *G*oquan and Kinari *g*aki or Kinari *k*aki. Thus in the case of Ginkgo, he might be rendering a sound which he thinks is closest to the one then prevalent.

Kaempfer's romanization of this word may be a vagary, according to modern pronunciation, but the difficulty of explaining this, as Barclay (1944) says, "to any one conversant with the vagaries of the many systems used for 'romanizing' the Japanese sounds, ... will certainly not seem insuperable." The fact to be noted is that Kaempfer was romanizing sounds of over 250 years ago and at a time when even the many different systems of romanizing Japanese sounds were not in existence. Thus the modern rendering Kyo is to him Kjoo or Koo or Kgo, the first two as individual sounds, and the last in combination with other sounds. Also the name Icho was to him Itsjo. The word Ginkgo is apparently not a misprint as suggested by Moule, as it is correctly listed also in the Index of Kaempfer's work together with the other words discussed here. To reject his spelling because it does not conform with modern pronunciation seems most illogical. The name Ginkgo may be worth looking into etymologically, but as the original spelling of Kaempfer was correctly adopted by Linnaeus as a botanical name, nomenclaturally speaking, there is no ground to reject it as an "unintentional orthographic error." As Ginkgo it has been known for nearly 250 years and certainly will be known as such forever.

[2] Endlicher gives in his monograph of the conifers a number of Chinese names in ideographs, either cited from Kaempfer or added by himself. Besides Kaempfer, he is one of the few European botanists to use Chinese characters in their publications. It may be mentioned that botanist Endlicher was also an advertent and competent sinologist, although he did not seem to have studied the botanical aspects of the Chinese literature.

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EARLY FLOWERING SHRUBS AT THE ARBORETUM

MARTHA H. STARR

Occupying a unique place among hardy woody plants is a small but well-loved group of trees and shrubs that, year after year, miraculously brighten the winter landscape with blossoms. Although they cannot compete in brilliance with the displays staged later by the Cherries, Crabapples or Lilacs, they are prized for their delicacy, fragrance and ability to bloom at a time of year when spring seems very "far behind."

Gathered together on a slope just inside the Hillcrest Avenue entrance gate at the Arboretum is a collection of these early shrubs and trees. The first to bloom are the Witch-hazels with their fragrant ribbon-like flowers. Sometimes as early as January the Vernal Witch-hazel, *Hamamelis vernalis,* develops a delicate tracery of reddish yellow blossoms against the winter background. This is followed in February or March by two other members of the family, *H. japonica* and *H. mollis*. The latter, the Chinese Witch-hazel, is a tall spreading shrub bearing comparatively large yellow flowers. It makes an excellent shrub for any garden. A hybrid, *H. japonica* x *mollis,* known as *H. intermedia* has shown much promise at the Arboretum. Although less showy than the yellow-flowered species, the large reddish flowers are extremely fragrant and hold up well when cut and brought indoors.

Also blooming with the Snowdrops and Crocuses are the Silver Maple (*Acer saccharinum*), the true Hazels (*Corylus* spp.), and the many Willows (*Salix* spp.) whose delicate green unfolding foliage is, to many, the very essence of spring. Two of the best of the "Pussy Willows", *Salix caprea* and *S. gracilistyla* are represented in the collection.

Soon after, while the Red Maples (*Acer rubrum*) are pushing out their cheery red flowers, the first of the Dogwoods come into their own. *Cornus officinalis* and *C. mas* are very similar, covered with tiny yellow flowers which lack the conspicuous white bracts of our native *C. florida.* Although lacking the fragrance of so many spring-blooming shrubs, these plants are both worth growing, not only for their early bloom but also for their good foliage, compact habit, and conspicuous red fruits borne in late summer. *C. officinalis* is to be particularly recommended because of its interesting exfoliating bark. Unfortunately, it is the more difficult of the two to obtain in nurseries.

A rare but choice plant blooming at this time is the Chinese *Chimonanthus praecox*. Closely related to the Magnolias, it bears small waxy flowers with yellow outer sepals and inner ones striped purplish-brown.

Winter heather (*Erica carnea*) and Winter Jasmine *(Jasminum nudiflorum)* are two plants which cannot be omitted. The latter is valued for cutting and forcing during the winter months.

The first of the Viburnums (*V. fragrans*) puts forth its pink buds at this time. Although inferior to other members of the genus in form and fruiting habit, it is well-loved for its early fragrant flowers. Another shrub recommended only because of its early flowering is *Forsythia ovata.* The other Forsythias which follow in ten days to two weeks are more floriferous.

Lonicera fragrantissima, as its name implies, is one of the most fragrant of the Honeysuckles. In an average winter we do not see it flower before the end of March; with two or three days of unseasonably warm weather, it will send out a few tentative white blossoms as early as January. Below is a record of its blooming dates over the last fourteen years which shows the wide variation possible. *L. Perpusii* and *L. Standishii* are two other early-blooming Honeysuckles. *L. Standishii* var. *lanciifolia,* with its leathery, lance-shaped leaves, is particularly commendable. These early Honeysuckles are the first of the shrubs to fruit—the red berries develop as early as June.

Corylopsis the Birches, Spice-Bush (*Lindera Benzoin*) and our native Trailing Arbutus (*Epigaea repens*) follow. With the Japanese Andromeda (*Pieris japonica*) come the first of the Rhododendrons, *R. dauricum* and the popular *R. mucronulatum* whose pale lavender flowers are so often seen growing in conjunction with *Forsythia.* The new *R. mucronulatum,* "Cornell Pink," a chance seedling discovered at Cornell University about 1932, is of special merit because of its pink blossoms at a time when the predominant colors are white, yellow or lavender. We hope to see this clone available in nurseries in the near future.

And here, with the Cherries and Star Magnolias about to burst into bloom, we leave the fragrant delicacy of the early flowers and plunge into another sudden, riotous Philadelphia spring.

A Comparison of Blooming Dates of *Cornus mas* and *Lonicera fragrantissima*:

	Cornus mas	*Lonicera fragrantissima*
1942	April 1	March 18
1943	March 24	March 24
1944	April 9	March 26
1945	March 18	March 17
1946	March 11	March 7
1947	March 26	March 28
1948	No flrs.	March 22
1949	March 11	March 14
1950	February 10	January 17
1951	March 7	February 26
1952	March 20	January 26
1953	February 20	February 1
1954	No flrs.	February 4
1955	March 7	March 9

THE ARBORETUM LIBRARY

JANET L. BOWEN

One of our Associates, upon the occasion of a recent visit to the Arboretum, expressed surprise on learning that she was permitted to borrow books from the Arboretum Library. We were, of course, delighted to acquaint her with the privileges which were hers in regard to the use of the Library, but the incident gave us pause. Perhaps other Associates as well as general readers of the Bulletin were unaware of their library privileges at the Arboretum; perhaps, indeed, some were unfamiliar with the extent and scope of the resources of the Library. Clarification of these points seemed in order and we therefore welcome this opportunity to bring the Library and its collections to the attention of our readers.

The Arboretum Library is one of nineteen departmental branches of the University of Pennsylvania Library. Comprising over 2,500 books and bound periodicals, the collection is housed in Thomas Soverign Gates Hall, the Arboretum Administration building at 9414 Meadowbrook Avenue. The library room is cheerful and attractive and serves on occasion as the center for Arboretum social functions. All the books are conveniently shelved and catalogued in accordance with the standard Dewey Decimal Classification system.

Realizing that a mere aggregation of books does not in itself constitute a living, working library, the Arboretum has adopted the policy of encouraging the use of its library facilities by all persons interested in the fields embraced in the collection. The Library is open from 9 a.m. to 4:30 p.m. Monday through Friday, and visitors are welcome to spend as much time as they wish during these hours. Books may be borrowed by all responsible individuals for a period of two weeks and may be kept longer "on call" for immediate return if needed by others.

Some idea of the scope of the collection may be obtained from the following list of categories into which the vast majority of the books fall:

- Agriculture
- Apiculture and Honey Plants
- Biology (general)
- Botany
  - Biography
  - Ecology
  - Floristics (regional and local floras)
  - General Botany (including textbooks, encyclopedias and publications of societies and botanical gardens)
  - Medical Botany (pharmaceutical works)
  - Morphology

Physiology
Phytopathology
Plant Distribution
Systematic Botany (Taxonomy)
Travel and Exploration
Forestry
Fruit Culture
Geology and Mineralogy
Horticulture (including general gardening; trees and shrubs for gardens; rock, wall and water gardens; ivies and ground covers; roses; azaleas and rhododendrons; house plants; flower arrangements; individual species)
Landscape Gardening
Paleontology
Planting Practices (including propagation, grafting, soil, planting methods, seed) and Plant Care (including fertilizers, pruning, blights, insect and weed control)
Zoology

The Library currently receives some sixty periodicals, many of them sent by arboretums and horticultural organizations throughout the country in exchange for the Morris Arboretum Bulletin. Twenty-three of these journals and bulletins are yearly bound and catalogued into the permanent collection. In addition, a goodly number of reprints, research notes, government publications and periodicals from foreign countries reach our shelves through exchange relationships.

A complete list of periodicals to be found in the Library would occupy too much space on these pages, but the following will suffice to indicate the nature of these acquisitions:

Agriculture Index
American Forests
American Journal of Botany
American Nurseryman
American Rhododendron Society Quarterly Bulletin
American Rose Magazine *(American Rose Society)*
Arboretum Bulletin of the University of Washington
Arborists News *(National Shade Tree Conference)*
Arnoldia *(Arnold Arboretum)*
Baileya *(Bailey Hortorium of Cornell University)*
Bibliography of Agriculture
Biological Abstracts (*Section D, Biological Sciences*)
Contributions of the Boyce Thompson Institute
Cornell Plantations
El Aliso *(Rancho Santa Ana Botanic Garden, Claremont, Calif.)*
Florist & Nurseryman
Flower Grower
Forestry Abstracts
Frontiers *(Academy of Natural Sciences)*
Garden Club of America Bulletin
Garden Journal *(New York Botanical Garden)*
The Garden Path *(Ohio Association of Garden Clubs)*
Gardening Illustrated (an English publication)
Gardeners Chronicle (an English publication)
Horticulture
Horticulture Abstracts
Lasca Leaves *(Southern California Horticultural Institute)*
Lloydia *(Lloyd Library and Museum, Cincinnati, Ohio)*
Missouri Botanical Garden Bulletin
Morton Arboretum Bulletin
National Horticulture Magazine *(American Horticultural Society)*
Park Maintenance
Pennsylvania Forests *(Pennsylvania Forestry Association)*
Plants and Gardens *(Brooklyn Botanic Garden)*
Reef Point Gardens Bulletin *(Max Farrand Memorial Fund, Bar Harbor, Maine)*
Rhodora *(New England Botanical Club)*
The Rose *(Philadelphia Rose Society)*
Royal Horticultural Society Journal
Shade Tree *(New Jersey Federation of Shade Tree Commissions)*
Trees
Washington Agricultural Experiment Station Bulletin
West Virginia Arboretum Newsletter
Wisconsin Arboretum News

Evodia as a Bee Tree

Mr. Fred W. Schwoebel, Curator of the Langstroth Bee Garden of the Morris Arboretum, has recently published two interesting articles[1] calling attention to the highly desirable qualities of *Evodia Daniellii* as a bee tree.[2] This Oriental species, which is a member of the Rutaceae, or Rue Family, is perfectly hardy throughout most of eastern temperate North America and, according to Mr. Schwoebel, is avidly sought by bees in search of nectar for honey. The tree is easily grown from seed, develops rapidly, is essentially free from diseases and blooms in mid-summer. A future number of the Bulletin will carry a detailed account of this and allied species of the genus *Evodia*.

Since the appearance of Mr. Schwoebel's two articles we have received approximately 300 requests for seed. The purpose of this note is to extend to our readers the opportunity of securing seeds of this valuable plant. A self-addressed, stamped envelope will bring you a small quantity of seeds of this tree together with instructions concerning its cultivation.

[1] Gleanings in Bee Culture, Vol. 83, no. 11, 660, November 1955; American Bee Journal, Vol. 95, no. 12, 469, December 1955.

[2] See Cover. Photograph by Dr. E. J. Schreiner.

ARBORETUM ACTIVITIES

(Continued from page 2)

Advisory Council

The Board of Managers recently approved a suggestion of the Director that there be set up an Advisory Council of the Arboretum to meet with him occasionally to discuss the welfare and activities of the Arboretum. Mrs. E. Florens Rivinus graciously consented to accept the chairmanship of this group and the following persons have agreed to serve as members:

Mrs. Frederick L. Ballard, Jr.
Mrs. Albert C. Barnes
Mrs. C. Reed Cary
Mrs. Morris Cheston
Mr. Richard B. Chillas, Jr.
Mr. Lloyd M. Coates
Mr. Henry F. du Pont
Mr. Carl W. Fenninger
Mrs. Thomas S. Gates
Dr. David R. Goddard
Mrs. Albert M. Greenfield
Mrs. Gaylord P. Harnwell
Mrs. Flagler Harris
Mrs. Sidney Keith
Mr. John B. Kelly
Mrs. John F. McCloskey
Mrs. Frederic Rosengarten
Mr. Maurice Bower Saul
Dr. Russell J. Seibert
Mrs. E. Newbold Taylor
Mr. George D. Widener
Mrs. W. B. Whitney, 2nd
Dr. J. J. Willaman
Mrs. E. F. R. Wood

The newly formed Council held its first meeting in Gates Hall at the Arboretum on Thursday. January 12. This was essentially an organizational session at which the Director explained the educational and research objectives of the Arboretum and invited the members to make suggestions as to how the Arboretum might render wider and more effective service to the community. Future actions of the Council will be published from time to time in these pages. J.M.F., Jr.